~~Same" filed September 16, 1997; copending Application Serial No. 08/916,694 entitled "System And Method For Carrying Out Information-Related Transactions Using Web Documents Embodying Transaction-Enabling Applets Automatically Launched And Executed In Response To Reading URL-encoded Symbols Pointing Thereto" by inventors Garrett Russell, David M. Wilz, Sr., and C. Harry Knowles filed August 22, 1997; copending Application Serial No. 08/869,164 filed June 4, 1997; copending Application Serial No. 08/846,219 entitled "Programmed Bar Code Symbol Reader For Accessing Internet-Based Information Resources By Scanning Java-Applet Encoded Bar Code Symbols", filed April 25, 1997; copending Application Serial No. 08/838,501 entitled "Internet-Based System And Method For Tracking Objects Bearing URL-Encoded Bar Code Symbols" by David M. Wilz, Sr. and C. Harry Knowles, filed April 7, 1997, which is a Continuation-in-Part of copending Application Serial No. 08/820,540 entitled "System And Method For Composing And Printing URL-Enclosed Bar Code Symbol Lists And Menus For Use In Visiting Internet-Based Information Resources By Scanning The Same" by Harry Knowles, filed March 19, 1997, which is a Continuation-in-part of copending Application Serial No. 08/753,367 filed November 25, 1996; copending Application Serial No. 08/645,331 filed September 24, 1996; copending Application Serial No. 08/615,054 filed March 12, 1996; copending Application Serial No. 08/573,949 filed December 18, 1995; copending Application Serial No. 08/292,237 filed May 17, 1994; copending Application Serial No. 08/365,193 filed December 28, 1994; copending Application Serial No. 08/293,493 filed August 19, 1994; copending Application Serial No. 08/561,479 filed November 20, 1995; copending Application Serial No. 08/278,109 filed November 24, 1995; copending Application Serial No. 08/489,305 field June 9, 1995; copending Application Serial No. 08/476,069 filed June 7, 1995; copending Application Serial No. 08/584,135 filed January 11, 1996 which is a continuation of copending Application Serial No. 08/651,951 filed May 21, 1996 which is a continuation of copending Application Serial No. 08/489,305 filed June 9, 1995 which is a continuation of Application Serial No. 07/821,917 filed January 16, 1992, now abandoned, which is a continuation-in-part of Application Serial No. 07/583,421 field September 17, 1990, now U.S. Patent No. 5,260,553, and Application Serial No. 07/580,740 filed September 11, 1990, now abandoned. Each~~ <u>each</u> said patent application is assigned to and commonly owned by Metrologic Instruments, Inc. of Blackwood, New Jersey, and is incorporated herein by reference in its entirety.

On Page 3, amend paragraph 1 as follows:

In general, laser scanning bar code symbol scanners are used for reading one-dimensional (1D) and two-dimensional (2-D) bar code symbols on products and packages for identification

purposes. 2-D bar code symbols are advantageous in that they have the capacity to encode a substantially ~~large~~ larger volume of data than 1D bar code symbols. Consequently, 2-D bar code symbols have enjoyed increasing popularity over recent years.

On Page 5, amend paragraph 5 as follows:

A further object of the present invention is to provide such a bar code symbol reading system, wherein the raster-type bar code symbol reading engine comprises a pair of mechanically-damped off-resonant laser beam scanning mechanisms that are arranged on a miniature optical bench and electronically-controlled by ~~a~~ an asynchronously driven drive circuit so that the raster laser scanning pattern floats slightly along the y-scanning direction to facilitate reading of 2-D bar code symbols during the hands-on mode of operation.

On Page 6, amend paragraph 6 as follows:

Another object of the present invention is to provide such a bar code symbol reading system, wherein the base portion of each scanning element is securely fixed to an optical bench and the laser beam deflecting portion is forced to oscillate substantially away from the natural resonant frequency of the scanning element, by a reversible electromagnet disposed in close proximity to a permanent ~~magnetic~~ magnet mounted to the rear surface of the laser beam deflecting portion.

On Page 7, amend paragraphs 3 and 4 as follows:

Another object of the present invention is to provide such a bar code symbol reading system, wherein the steady-state frequency of oscillation can be set at the time of manufacture to be any one of a very large range of values (e.g., 50-500 Hz) for use in both ~~high-speed~~ low-speed and high-speed laser scanning systems.

Another object of the present invention is to provide such a bar code symbol reading system, wherein the laser beam scanning mechanism has ultra-low power consumption, and a low operating current.

On Page 8, amend paragraphs 5 and 9 as follows:

A further object of the present invention is to provide such a bar code symbol reading system, wherein the base unit contains a battery recharging device that automatically recharges

batteries contained in the hand-supportable device when the hand-supportable device is supported within the base unit.

It is another object of the present invention to provide such ~~an~~ a bar code symbol reading system with a mode of operation that permits the user to automatically read one or more bar code symbols on an object in a consecutive manner.

On Page 9, amend paragraph 2 as follows:

An even further object of the present invention is to provide an automatic hand-supportable bar code reading device which prevents multiple reading of the same bar code symbol due to the swelling of the laser scanning beam upon a bar code symbol for an extended period of time.

and delete paragraph 3 as follows:

~~A further object of the present invention is to provide a point-of-sale station incorporating the automatic bar code symbol reading system of the present invention.~~

On Page 11, amend paragraphs 2 and 8 as follows:

Fig. 4B is a perspective view of the hand-supportable bar code symbol reader of the present invention of ~~Fig. 1,showing~~ Fig. 1, showing the automatic hand-supportable bar code symbol reading device being removed from its counter-top base unit;

Fig. 5D is a perspective view of the automatic bar code symbol reading engine of the present invention, shown within the upper portion of the miniature match-box size housing removed ~~off~~ from the lower housing portion thereof;

On Page 12, amend paragraphs 4, 5 and 10 as follows:

Fig. 7 is a perspective view of a chemically-etched sheet of double-sided ~~cooper-clad~~ copper-clad base material used to mass-manufacture the scanning element of the scanning mechanism of Fig. 6;

Fig. 7A is a cross-sectional view taken along line 7A-7A of Fig. 7 showing a portion of the double-sided ~~cooper-clad~~ copper-clad base material that has not been chemically etched;

Fig. 8B2 is a schematic representation of the drive current signal supplied to the electromagnetic coil of the X-axis laser beam scanning module employed in the bar code symbol reading engine of Fig. 5A;

On Page 13, amend paragraphs 1, 2 and 6-11 as follows:

Fig. 8B4 is a schematic representation of the voltage signal used to drive the electromagnetic coil of the Y-axis laser beam scanning module employed in the engine of Fig. 5A when a four-line raster scanning pattern is to be produced;

Fig. 8B5 is a schematic representation of the voltage signal used to drive the electromagnetic coil of the Y-axis laser beam scanning module employed in the engine of Fig. 5A when a eight-line raster scanning pattern is to be produced;

~~Fig. 8C is~~ Figs. 8CA through 8CD collectively show a schematic diagram of a second circuit which can be used to produce ~~asynchronized~~ a synchronized coil-drive signals for use by the raster-type laser scanning engine shown in Fig. 5A;

Fig. 8C1 is a schematic block diagram of the electronically-controlled potentiometer employed in the coil-drive signal generation circuit of ~~Fig. 8C is~~ Figs. 8CA through 8CD;

Fig. 8C2 is a schematic diagram of the potentiometer employed in the coil-drive signal generation circuit of ~~Fig. 8C is~~ Figs. 8CA through 8CD;

Fig. 8D1 is a schematic representation showing how the direction select signal (U/D) is produced the Y-Direction Sweep Rate Control Circuit using the x-coil drive voltage signal generated by the coil drive voltage generation circuit of ~~Fig. 8C is~~ Figs. 8CA through 8CD;

Fig. 8D2 is a schematic representation showing how, during the high-speed/low-resolution raster mode, the y-coil drive voltage signal is ($V_W$) is produced from the electronically-controlled potentiometer/drive circuit using, as input, the direction select signal (U/D) generated from the Y-axis sweep rate control circuit and the increment signal (INC) generated from the Y-axis step time control circuit employed in the Y-axis drive voltage generation circuit of ~~Fig. 8C is~~ Figs. 8CA through 8CD;

Fig. 8D3 is a schematic representation showing how, during the high-speed/high-resolution raster mode, the y-coil drive voltage signal ~~is~~ ($V_W$) is produced from the electronically-controlled potentiometer/drive circuit using, as input, the direction select signal (U/D) generated from the Y-axis sweep rate control circuit and the increment signal (INC) generated from the Y-axis step time control circuit employed in the Y-axis drive voltage generation circuit of ~~Fig. 8C is~~ Figs. 8CA through 8CD;

On Page 16, amend paragraphs 2 and 7 as follows:

Figs. 17 and ~~17~~ 17A, taken together, set forth a flow chart illustrating the steps undertaken during the control process carried out in the base unit of Fig. 15C;

Fig. 22 is a perspective view ~~of a perspective view~~ of a sixth illustrative embodiment of the automatic bar code symbol reading system of the present invention realized in the form of a body-wearable Internet-based data transaction terminal, wherein a laser beam scanning engine (i.e. module) employing low-power laser-based object detection is integrated therewith for scanning 1-D and 2-D bar code symbols;

On Page 17, amend paragraph 7 as follows:

As shown in Figs. 1 to 3A2, the first illustrative embodiment of the bar code symbol reading system of the present invention is realized in the form of a fully-automatic bar code symbol reading system 1 comprising an automatic (i.e., triggerless) portable bar code (symbol) reading device 2 operably associated with a base unit 3 having a scanner support stand 4. As shown, bar code symbol reading device 2 is operably connected with its ~~the~~ base unit 3 by way of a one way electromagnetic link 5 that is momentarily created between bar code symbol reading device 2 and its mated base unit 3 after the successful reading of each bar code symbol by the bar code symbol reading device. Operable interconnection between the base unit and a host system (e.g., electronic cash register system, data collection device, etc.) 6 is achieved by a flexible multiwire communications cable 7 extending from the base unit and plugged directly into the said data-input communications port of the host computer system 6. In the illustrative embodiment, electrical power from a low voltage direct current (DC) power supply (not shown) is provided to the base unit by way of a flexible power cable 8. Notably, this DC power supply can be realized in host computer system 6 or as a separate DC power supply adapter pluggable into a conventional 3-prong electrical socket. As will be described in greater detail hereinafter, a rechargeable battery power supply unit is contained with bar code symbol reading device 2 in order to energize the electrical and electro-optical components therewithin.

On Page 19, amend paragraph 1 as follows:

As illustrated in Figs. 2 through 2B in particular, head portion 9A continuously extends into contoured handle portion 9B at an obtuse angle $\alpha$ which, in the illustrative embodiment, is about 146 degrees. It is understood, however, that in other embodiments obtuse angle $\alpha$ may be in the range of about 135 to about 180 degrees. As this ergonomic housing design is sculptured (i.e., form-fitted) to the human hand, automatic hands-on scanning is rendered as easy and effortless as waving ~~ones~~ one's hand. Also, this ergonomic housing design eliminates the risks of musculoskeletal disorders, such as carpal tunnel syndrome, which can result from repeated biomechanical stress commonly associated with pointing prior art gun-shaped scanners at bar code symbols, squeezing a trigger to activate the laser scanning beam, and then releasing the trigger.

On Page 20, amend paragraph 1 as follows:

When using any of the bar code symbol reading devices of the present invention in commercial environments, such as retail stores, the wireless nature of the bar code symbol reader/base unit interface permits the operator thereof to ~~accidently~~ accidentally or deliberately walk off with the bar code symbol reading device. This could have serious financial consequences ~~which could prevent~~ preventing commercially successful utilization of the system in such operating environments. In the illustrative embodiments hereof, this problem is solved by providing each bar code symbol reader with an electrically-passive tuned resonant circuit 500 (i.e., target), realized on an ultra-thin adhesive label 501 affixed to either the exterior or interior of the hand supportable housing, as shown in Fig. 2A. The tuned resonant circuit 500 is identical to those used on products such as library books, compact discs, and other valuable goods sold in retail outlets. When the bar code symbol reader is moved through the exit door of the store, the tuned resonant circuit 500 absorbs energy from the magnetic field produced by magnetic field generation panels 502 and 503 installed of an electronic article surveillance system 504 installed at the store exit. When a bar code symbol reader bearing tuned resonant circuit 500 is moved through the magnetic interrogation field produced by panels 502 and 503, the tuned resonant circuit absorbs power from the magnetic field and the corresponding current fluctuation is detected by current sensing circuitry which triggers an audible alarm 505, notifying store management that the bar code symbol reader has been removed from the store without authorization. Various types of targets, interrogation field panels and electronic current sensing circuitry may be used to practice this aspect of the present invention. Suitable anti-theft detection (or electronic article surveillance) systems for practicing this aspect of the present invention can be found in U.S. Patent Nos. 4,870,391 to Cooper; 4,751,500 to Minasy, et al.; and

4,684,930 to Minasy, et al., which are hereby incorporated by reference in their entirety. This method provides an inexpensive way of securing bar code symbol scanning devices using an electrically-passive ~~elements~~ <u>element</u> mounted on portable scanners within the system (or network), and thus is much less expensive and much simpler than providing a signal receiver within the bar code symbol scanner itself, or using an electrically-active security tag on the portable scanner.

On Page 21, amend paragraph 3 as follows:

In general, detected energy reflected from an object during object detection can be optical radiation or acoustical energy, either sensible or non-sensible by the user, and may be <u>generated</u> either ~~generated~~ from the automatic bar code reading device or an external ambient source. However, as will be described in greater detail hereinafter, the provision of such energy is preferably achieved by transmitting a wide beam of pulsed infrared (IR) light away from transmission aperture 11, in a direction substantially parallel to longitudinal axis 16 of the hand-supportable housing. In the preferred embodiment, the object detection field, from which such reflected energy is collected, is designed to have a narrowly diverging pencil-like geometry of three-dimensional volumetric expanse, which is spatially coincident with at least a portion of the transmitted infrared light beam. This feature of the present invention ensures that an object residing within the object detection field will be illuminated by the infrared light beam, and that infrared light reflected therefrom will be directed generally towards the transmission aperture of the housing where it can be automatically detected to indicate the presence of the object within the object detection field. In response, a visible laser beam is automatically generated within the interior of the bar code symbol reading engine, projected through the light transmission aperture of the housing and repeatedly scanned across the scan field, within which at least a portion of the detected object lies. At least a portion of the scanned laser light beam will be scattered and reflected off the object and directed back towards and through light transmissive window 11 for collection and detection within the interior of the bar code symbol reading engine, and subsequently processed in a manner which will be described in detail hereinafter.

On Page 23, amend paragraph 2 as follows:

When the bar code symbol reading engine 18 employs the "synchronous" type scanning element drive circuit shown in Figs. 8A-8B5, a high-speed/low-resolution raster scanning pattern is repeatedly generated from bar code symbol reading device 2 with minimal movement of the raster scanline pattern relative to the scanner housing, during scanning operations. When the bar

code symbol reading engine 18 employs the "asynchronous" type scanning element drive circuit shown in Figs. ~~8C-8D3~~ 8CA-8D3, a high-speed/low-resolution raster scanning pattern is repeatedly generated from bar code symbol reading device 2 with a slight degree of float or movement of the raster scanline pattern relative to the scanner housing, during scanning operations. In either case, the high-speed/low-resolution mode of operation is ideally suited for reading 2-D bar code symbols printed on sheets of paper or like print media.

On Page 24, amend paragraph 3 as follows:

When the bar code symbol reading engine 18 employs the "synchronous" type scanning element drive circuit shown in Figs. 8A-8B5, a high-speed/high-resolution raster scanning pattern is repeatedly generated from bar code symbol reading device 2 with minimal movement of the raster scanline pattern relative to the scanner housing, during scanning operations. When the bar code symbol reading engine 18 employs the "asynchronous" type scanning element drive circuit shown in Figs. ~~8C-8D3~~ 8CA-8D3, a high-speed/high-resolution raster scanning pattern is repeatedly generated from bar code symbol reading device 2 with a slight degree of float or movement of the raster scanline pattern relative to the scanner housing, during scanning operations, rendering it easier to read 2-D bar code symbols in the hands-on mode of operation.

On Page 27, amend paragraph 1 and 2 as follows:

As shown in Figs. 6 through 6B, each scanning element in the raster scanning mechanism hereof has a laminated construction, wherein: the anchored base portion 402 and the laser beam portion 405, each consist of a thin layer of Kapton™ polyamide 416 sandwiched between a pair of thin layers of cooper 417A and 417B, and 418A and 418B, respectively; and the flexible gap portion 406 consisting of the thin layer of Kapton™ (polyamide) plastic material 18 and a ~~think~~ thick layer of mechanically-damping film material, such as screenable silicone rubber (General Electric SLA 7401S-D1), having a suitable duromater measure, e.g., Shore A40. Notably, the thin layer of polyamide in the anchored base portion 402, the flexible gap portion 405 and the laser beam deflecting portion 406 is realized as a single unitary layer having a uniform thickness across these individual portions of the scanning element. The copper layers on opposite sides of the anchored base portion, the flexible gap portion and the laser beam deflecting portion of the scanning element are discrete elements of uniform thickness realized by precisely-controlled chemical-etching of the copper and polyamide layers during particular stages of the scanning element fabrication process described below.

~~A~~ As shown in greater detail in Fig. 6, the x and y axis laser beam scanning mechanisms in bar code reading engine 18 are each realized on optical bench 86 having planar dimensions. Magnetic-field producing coil (i.e., electromagnetic coil) 440A (440B) is supported upon a first projection (e.g., bracket) 427 which extends from the optical bench. The scanning element of the present invention described above is mounted upon a second projection 428 which extends from the optical bench. The permanent magnet 408 is placed in close proximity with the magnetic-field producing coil 440A (440B), as shown in Figs. 5D, 6 and 6B. Visible laser diode (VLD) 177 produces an output laser beam 431 which is directed towards laser beam deflecting portion 405 onto the y-axis scanning element 405A and reflects onto the x-axis scanning element 405B, and thus along the projection axis of the scanning module. The y-axis scanning element 405A is forced into oscillatory motion by driving the electromagnetic coil 440A with a voltage signal having a frequency substantially off the resonant frequency of the y-axis scanning element (e.g. by at least 10%). Similarly, the y-axis scanning element 405B is forced into oscillatory motion by driving the electromagnetic coil 440B with a voltage signal also having a frequency substantially off the resonant frequency of the x-axis scanning element (e.g. by at least 10%).

On Page 28, amend paragraphs 1 and 2 as follows:

In the illustrative embodiments disclosed herein, the x-axis electromagnetic coil 440B is driven in a ~~push-pullmode~~ push-pull mode, wherein the magnetic polarity reverses periodically at a rate determined by the amplitude variation of the voltage signal applied across the terminals of the electromagnetic coil 440B. A suitable voltage waveform for driving the x-axis electromagnetic coil 440B in the laser beam scanning mechanism is shown in Fig. 8B2. As shown in Fig. 8A, an electronic circuit 56 for producing this drive signal can be realized by a conventional push-pull current drive integrated circuit (IC) chip (556 in Fig. 8A) connected to magnetic-field producing coil 440A in an electrically-floating manner (i.e., not connected to electrical ground). As shown, a resistor-capacitor (RC) network 558 is connected to the push-pull current drive IC 56 in order to set the scan speed (e.g., 500 sweeps or lines per second). In the illustrative embodiments, the scan speed of the x-axis laser scanning module can be adjusted between about 50 to 700 lines/second by setting the RC time constant using an external resistor $R_1$ and capacitor $C_1$, although it is understood, that in other embodiments, the scan speed can be extended above and below this range as required by the particular application at hand.

In Fig. 5E, a second illustrative embodiment of raster-type laser scanning mechanism described above is shown realized within an ultra-compact plastic housing 500, wherein electromagnetic coil 440A and 440B, and the laser beam scanning mechanism of Figs. 5D, 6, 6A and 6B are mounted with holographic beam modifying optics of the kind disclosed in Applicants'

copending Application No. 09/071,512 entitled "DOE-Based Systems And Devices For Producing Laser Beams Having Modified Beam Characteristics", filed May 1, 1998, and incorporated herein by reference. In all other respects, the bar code reading engine of Fig. 5E is the same as that shown in Fig. 5A. As shown, plastic housing 500 comprises a top plate 500A, side walls extending from the base plate, and a surface for mounting the anchorable base portions of the scanning elements 405A and 405B thereto. Housing 500 also is provided with recesses in its side wall, within which the magnetic-field producing coils 440A and 440B can be mounted in a press-fit manner. When assembled, the scanning elements 405A and 405B extend towards the central axes of the magnetic-field producing coils 440A and 440B, respectively, so that the permanent magnet 408A and 408B are closely positioned adjacent to one end of the respective coils, while the other ends thereof, mounted on a support post in recess, are mounted thereto. The terminals of the magnetic-field producing coils can be passed through small holes drilled in side walls. Top plate 500A snaps onto the top surface of the side walls of the housing, while the two pairs of posts straddle the flexible gap portion 406A (406B) of the x and y axis scanning elements and function to delimit the maximum angular swing thereof if and when the raster scanning mechanism is subjected to excessive external forces as might be experienced when ~~dropped to~~ the unit is dropped to the ground. In such an assembled configuration, the laser beam scanning module has a scanning aperture 501, through which the laser beam can be swept along either a 1-D or 2-D (raster) scanning pattern. Preferably, all of the components of the housing described above are fabricated using injection molding technology well known in the art.

On Page 30, amend paragraphs 3 and 4 as follows:

Both sides of the 12' ' x12' ' sheet of base material 420 are screen-printed with a pattern of copper-protective ink ("photo-resist"). The copper-protective pattern is structured so that it covers those areas of the sheet where the copper elements associated with the anchorable base portion 402 and the laser beam deflecting portion 405 of many scanning elements are to be formed on the polyamide layer in a spatially-registered manner, as shown in Figs. 7 and 7B. Those areas not covered by the copper-protective pattern (i.e., where the gap portions of the scanning elements are to be formed and scanning element mounting hole 425) are susceptible to the copper-etchant to be used in a subsequent etching stage. After the copper-protective pattern is printed, the sheet is exposed to the copper-etchant by dipping the sheet in a reservoir of the same. Thereafter, the chemically-etched sheet, having etched copper surfaces 423A and 423B, is rinsed in a conventional manner. ~~As~~ At this stage of the fabrication process, the copper elements associated with the anchorable base portion and the laser beam portion of four-hundred (400) scanning elements are formed on 12"x12" sheet in a spatially-registered manner; also, the gap

portions of the scanning elements made from polyamide material are also formed between corresponding base and laser beam deflecting portions.

The next stage of the fabrication process involves screen-printing a pattern of polyamide-protective ink on the chemically-etched sheet. The polyamide-protective pattern is structured so that it covers those areas of the sheet where the polyamide gap portions 406 have been previously formed, as well as very thin strips or string-like elements (e.g., called "stringers") between the copper elements associated with the anchorable base portion and the laser beam portion of neighboring scanning elements. Those areas of exposed polyamide not covered by the polyamide-protective pattern described above (e.g., scanning element mounting hole 425) are susceptible to the polyamide-sensitive etchant that is to be used in a subsequent etching stage. After the polyamide-protective pattern is printed, the sheet is exposed to the polyamide-etchant by dipping the partially-etched sheet in a reservoir of the same. Thereafter, the etched sheet is rinsed in a conventional manner. At this stage of the fabrication process, the polyamide elements associated with the gap portion of the four-hundred scanning elements are formed on 12"x12" ~~sheet~~ sheets, along with the copper elements associated with the base portions and laser beam deflecting portions thereof. Each scanning element is suspended with respect to its neighboring scanning element by way of the formed "stringers" 424 which can easily be broken by gently pulling a fabricated scanning element from the nested matrix of scanning elements formed in the etched ~~copper-cladded~~ copper-clad sheet described above.

On Page 37, amend paragraph 3 as follows:

In the illustrative embodiment, the system control module $C_3$ or $C_2$ is operably connected to the symbol decoding module 134. Typically, the symbol decoding module is realized as part of a programmed microprocessor capable of decoding 1-D and 2-D bar code symbols using autodiscrimination techniques and the like well known in the art. During decode processing, the symbol decoding module 134 carries out one or more 2-D decoding algorithms (including PDF 417 algorithms). Such decoding algorithms may include scan pattern optimization control logic. According to such logic, if during the 2-D decoding process, a bar code symbol is decoded, then the decoding module proceeds to determine how many rows of scan data are contained in the 2-D bar code symbol. This is achieved by reading the "row" indication field in the decoded line of scan data and determining the number of rows within the scanned 2-D bar code symbol. When this information is recovered by the symbol decoding module, it is then provided to the appropriate system control module $C_3$ or $C_2$. In turn, the system control module uses this information to generate a control signal for the data-selector/multiplexer 561. The control signal selects a signal (at the multiplexer's input) which drives the y-axis magnetic-field producing coil

440B in an manner that the 2-D bar code symbol is optimally scanned using a high-speed raster-type laser scanning pattern.

On Page 38, amend paragraph 1 as follows:

For example, in some applications, it will be desirable to initially scan using a raster-type 2-D scanning pattern. This if the symbol decoding module detects a 1-D bar code symbol, then the system controller will automatically produce a control signal that causes the multiplexer 561 to select a DC-type drive voltage, thereby causing the y-axis magnetic-field producing coil 440B to remain pinned down, and be prevented from deflecting the laser beam along the y-axis of the scanning beam. In other applications, it will be desirable to initially scan using a 1-D scanning pattern. In such cases, if the symbol decoding module 134 detects a 1-D bar code symbol, then the system control module will automatically continue producing a control signal that causes the multiplexer 561 to select a DC voltage, thereby causing the y-axis magnetic-field producing coil 440B to remain pinned down, and prevented from deflecting the laser beam along the y-axis of the scanning beam.

On Page 39, amend paragraphs 1-3 as follows:

If the symbol[,] decoding module determines that the PDF symbol has between 2-4 rows of data, then the system control module will produce a control signal that causes the multiplexer 561 to select a clock signal that causes the y-axis magnetic-field producing coil 440B to produce a 2-line raster scanning pattern. If the symbol decoding module determines that the PDF symbol has between 5-10 rows of data, then the system control module will produce a control signal that causes the multiplexer to select a clock signal that causes the y-axis magnetic-field producing coil 440B to produce a 4-line raster scanning pattern. If the symbol decoding module 134 determines that the PDF symbol has ~~between~~ 11 or more rows of data, then the system control module will produce a control signal that causes the multiplexer to select a clock signal that causes the y-axis magnetic-field producing coil 440B to produce a 4-line raster scanning pattern. If the symbol decoding module 134 determines that the PDF symbol has ~~between~~ 11 or more rows of data, then the system control module will produce a control signal that causes the multiplexer to select a clock signal that causes the y-axis magnetic-field producing coil 440B to produce an 8-line raster scanning pattern.

During operation of the x and y coil drive circuitry shown in Fig. 8A, the push-pull drive IC 556 thereof produces a clock signal 557 as shown. Based on this clock signal, a current drive signal shown in Fig. 8B2 is produced for driving the x-axis magnetic-field producing coil 440A.

As the operation of the x-axis magnetic-field producing coil 440A is reversible (i.e., its magnetic polarity reverses in response to current direction reversal therethrough), the current direction is referenced to about a zero milliap value. Each time the current drive signal changes direction through windings of the x-axis magnetic-field producing coil 440A, so too does the magnetic polarity of the magnetic-field produced thereby and thus the direction of deflection of the scanning element along the x-axis.

To prevent deflection of the laser beam along the y-axis, and thus ~~erate~~ create a 1-D scanning pattern, the system control module will select a DC voltage at multiplexer 561. The selected DC voltage will forward bias the current drive transistor 565 so that a constant current flows through y-axis magnetic-field producing coil 440B, pinning the scanning element of the y-axis scanning module and preventing deflection of the laser beam along the y-axis in response to the base clock signal 557 shown in Fig. 8B6.

On Page 40, amend paragraphs 1 and 2 as follows:

To produce a 2-D raster-type laser scanning pattern, the system control module will select one of the voltage signals shown in Figs. 8B3 through 8B5 for driving current drive transistor 565 connected to the y-axis magnetic-field producing coil 440B. As illustrated in Fig. 8A, whenever the amplitude of the selected voltage signal is below a predetermined threshold (e.g., 0 Volts), then ~~invertor~~ inverter 564 will produce an output voltage which forward biases the current drive transistor 565, causing electrical current to flow through the y-axis magnetic-field producing coil and a magnetic field are produced in response thereto. Under such conditions, the y-axis magnetic-field producing coil and a magnetic field produced in response thereto. Under such conditions, the y-axis magnetic-field producing coil 440B deflects the laser beam long they y-axis. When the amplitude of the selected voltage signal rises above the threshold level, the output of the ~~invertor~~ inverter 564 decreases so that the current drive transistor 565 is no longer forward-biased. This condition causes current flow through the y-axis magnetic-field producing coil to cease and the magnetic field therefrom to collapse, thereby allowing the scanning element to deflect the laser beam I the opposite direction.

When the selected control voltage changes polarity, the y-axis coil is once again actively driven and the scanning element thereof deflected, causing the horizontally deflected laser beam to be deflected ~~n~~ along the y-axis direction. The number of horizontal scan lines produced each time the laser beam is deflected along the y-axis direction depends on how slowly the amplitude of the selected control voltage (from the multiplexer 561) changes as the x-axis magnetic-field producing coil 440A deflects the laser beam along the x-axis direction each time the current

drive signal shown in Figs. 8B3 through 8B5 undergoes a signal level transition from high to low.

On Page 42, amend paragraph 2 and 3 as follows:

In Figs. ~~8C~~ <u>8CA</u> through 8D3, a second circuit is disclosed for producing asychronized coil-drive signals that can be used by the raster-type laser scanning engine of Fig. 5A to drive the electromagnetic coils 440A and 440B thereof.

As shown in ~~Fig. 8C~~ <u>Figs. 8CA through 8D3</u>, the coil drive signal generation circuit 181' comprises a number of subcircuits, namely: a clock timing signal producing circuit 600 for producing a master clock timing signal (e.g. f= 4000 HZ) to be used within circuit 181'; an electronically-controlled potentiometer circuit 601 for incrementing the y-coil drive voltage signal ($V_W$) by (i) a predetermined voltage amount and (ii) along a direction of voltage movement (e.g. up or down); a transistor driver $Q_2$ 602 for converting the output drive voltage signal $V_W$ into a coil drive current signal for driving the y axis coil 440B; a y-axis step/increment control circuit 603 for producing a voltage increment signal (INC) for supply to the electronically-controlled potentiometer 604; a y-axis sweep-rate/direction control circuit 604 for generating a direction select/control signal (U/D) for supply to the electronically-controlled potentiometer 601; a 12-bit synchronous counter circuit 605 for dividing the master clock timing signal (f=4000HZ) into (i) an appropriate timing control signal for supply to the y-axis step/increment control circuit 603 during the raster mode detected by mode detection circuit607, and (ii) an appropriate timing control signal for supply to y-axis sweep-rate/direction control circuit 604 during the raster mode detected by mode detection circuit607; a highspeed push-pull x-coil drive signal circuit 606 for producing a drive voltage signal to the x-axis coil 440A; an in/out-of-stand detection circuit 607 for detecting whether the bar code symbol reader 2 is disposed within its support stand 3, or is removed therefrom and automatically supplying a control signal to the y-axis step/increment control circuit 603 and y-axis sweep-rate/direction control circuit 604 for enabling the selection of appropriate timing control signals provided thereto by the synchronous counter circuit 605.

On Page 43, amend paragraphs 1 and 3 as follows:

The function of the in/out-of-stand detection circuit 607 is to detect whether the bar code symbol reader 2 is disposed within its support stand 3, or is removed therefrom and automatically supply a control signal to the y-axis step/increment control circuit 603 and y-axis sweep-rate/direction control circuit 604 so as to enable the supply of appropriate timing control

signals (generated by the synchronous counter circuit 605) to the y-axis step/increment control circuit 603 and y-axis sweep-rate/direction control circuit 604. In turn, these control circuits 603 and 604 generate signals INC and U/D respectively for provision as input to the electronically-controlled potentiometer 601, as required by the detected raster mode set by the mode selection circuit 115 (e.g. Hall-effect switch or control signal from a control module $C_2$ or $C_3$) and detected by in/out-of-stand detection circuit 607.[.]

The function of the y-axis step/increment control circuit 603 is to produce voltage increment signal (INC) for supply to the electronically-controlled potentiometer 601 so that the output voltage $V_W$ is incremented and thus the y-axis scanning element 405B incrementally deflected by the y-coil 440B during raster scanning operations, thus sweeping the laser beam along the y-axis direction of the scanner. In its illustrative embodiment, circuit 603 is constructed using a pair of NAND gates and a NOR gate configured as shown in ~~Fig. 8C~~ Figs. 8CA through 8D3.

On Page 44, amend paragraphs 1 and 3 as follows:

The function of the axis sweep-rate/direction control circuit 604 is to produce voltage direction select/control signal (U/D) for supply to the electronically-controlled potentiometer 601 so that the direction of voltage incrementation in $V_W$ is periodically changed from UP to DOWN and vice versa, in a manner corresponding the UP and DOWN traversals of the rastered laser beam during scanning operations. In the illustrative embodiment, circuit 604 is constructed using a pair of NAND gates and a NOR gate configured as shown in ~~Fig. 8C~~ Figs. 8CA through 8D3.

In Fig. 8D1, the x-coil drive voltage signal is schematically represented independent of the y-coil drive voltage signal in order to emphasize that the x-coil drive voltage signal and the y-coil drive voltage signal are not synchronized in the preferred embodiment of x-v coil-drive signal generation circuit 181'. In Fig. 8D2, the y-coil drive voltage signal produced by circuit 181' in the high-speed/low-resolution raster mode is schematically depicted in conjunction with the voltage incrementation direction control signal (U/D) generated during this mode of scanner operation. In Fig. 8D3, the y-coil drive voltage signal produced by circuit 181' in the high-speed/high-resolution raster mode is schematically depicted in conjunction with the voltage incrementation direction control signal (U/D) generated during this mode of scanner operation. Notably, in each such mode of scanner operation, the y-coil drive voltage signal increments in a step-wise manner in the UP direction, and at the end of +y axis direction (corresponding to the

top of a scanned bar code), remains at a fixed value for a number of clock cycles, and then decrements in a step-wise manner in the DOWN direction, and at the end of -y axis direction (corresponding to the bottom of the scanned bar code), remains at a fixed value for a number of clock cycles, with the process repeating itself, again and again, as shown in Figs. 8D2 and 8D3. By virtue of such voltage characteristics, the y-coil 440B cyclically drives the y-axis scanning element 405B back and forth along the y axis scanning direction, while the x-coil 440A cyclically drives the x-axis scanning element 405A back and forth along the x axis scanning direction, in a non-synchronous manner, enabling the entire raster scanning pattern to float up and down along the y-axis scanning direction. Such pattern-floating action ~~facilates~~ facilitates scanning the entire region of a 2-D bar code symbol presented within the raster scanning field generated by the bar code reading engine 18.

On Page 48, amend paragraph 1 as follows:

Referring to Fig. 5F, it is noted that the pulsed optical signal from LED 148 is transmitted so as to broadly illuminate the scan field. When an object is present within the object detection portion of the scan field, a reflected optical pulse signal is produced and ~~focussed~~ focused through focusing lens 153 onto photodiode 150. The function of photodiode 150 is to receive (i.e., sense) the reflected optical pulse signal and, in response thereto, produce a current signal IR REC.

On Page 49, amend paragraph 2 as follows:

In general, first control logic block $C_1$ provides the first level of system control. This control circuit activates the object detection circuit 107 by generating enable signal $E_0=1$, it activates laser beam scanning circuit 108, photoreceiving circuit 109 and A/D conversion circuit 110 by generating enable signal $E_1=1$, and it activates bar code symbol detection circuit 111 by generating enable signal $E_2=1$. In addition, the first control circuit $C_1$ provides control lines and signals in order to control these functions, and provides a system override function for the low power standby mode of the bar code symbol reading engine. In the illustrative embodiment, the specific operation of first control circuit $C_1$ is dependent on the state of several sets of input signals (i.e., activation control signal $A_0$ and $A_1$, and override signals $C_2/C_1$, [$C_3/C_1$-1] $\underline{C_3/C_{1\text{-}1}}$ and [$C_3/C_1$-2] $\underline{C_3/C_{1\text{-}2}}$ ) and an internally generated digital timer signal B. A preferred logic implementation of the first control circuit $C_1$ is set forth in Figs. 8I and 8J. The functional dependencies among the digital signals in this circuit are represented by the Boolean logic

expressions set forth in the Table of Fig. 8K, and therefore are sufficient to uniquely characterize the operation of first control circuit $C_1$.

As shown in Fig. 8I, first control circuit comprises a pair of logic ~~invertors~~ inverters 161 and 162, an OR gate 163, a NAND gate 164, a NOR gate 165, an AND gate 166, and a digital timer circuit 167 which produces as output, a digital output signal B. As shown, digital timer circuit 167 comprises a flip-flop circuit 170, a NOR gate 171, a clock divide circuit 173, a comparator (i.e., differential) amplifier 172, and a NPN transistor 174. As illustrated, activation control signal $A_1$ is provided to the CLK input of flip-flop 170 by way of ~~invertor~~ inverter 161. The QNOT output of the flip-flop is provided as one input to NOR gate 171, whereas the other input thereof is connected to the CLK input of clock divide circuit 173 and the output of comparator amplifier 172. The output of the NOR gate is connected to the base of transistor 174, while the emitter thereof is connected to the electrical ground and the collector is connected to the negative input of comparator amplifier 172 as well as the second timing network 105, in a manner similar to the interconnection of first timing network 102 to primary oscillation circuit 101. Also, the divided clock output (i.e., CLK/2048) produced from clock divide circuit 173 is provided to the CL input of flip-flop 170. As shown, the Q output of flip-flop 170 is connected to the reset (RST) input of the clock divide circuit 173 as well as to one input of OR gate 163, one input of NOR gate 165, and one input of AND gate 166. Notably, the Q output of the flip-flop is the digital output signal B indicated in each of the Boolean expressions set forth in the Table of Fig. 8K.

On Page 51, amend paragraphs 1 and 3 as follows:

As shown in Fig. 8I, enable signal $A_0$ from the system override signal detection circuit 100 is provided as the second input to OR gate 163, and the output thereof is provided as input to NAND gate 164. The override signal $C_2/C_1$ from second control circuit $C_2$ is provided as the input to ~~nvertor~~ inverter 162, whereas the output thereof is provided as the second input to AND gate 166. The override signal [$C_3/C_1$-1] $C_3/C_{1\text{-}1}$ from third control module $C_3$ is provided as the second input to NAND gate 164, whereas the output thereof produces enable signal $E_0$ for activating the object detection circuit 107. The override signal [$C_3/C_1$-2] $C_3/C_{1\text{-}2}$ is provided to the second input to NOR gate 165, whereas the output thereof produces enable signal $E_1$ for activating laser scanning and photoreceiving circuits 108 and 109 and A/D conversion circuit 110. The output of AND gate 166 produces enable signal $E_2$ for activating bar code symbol detection circuit 111.

As reflected in the Boolean expressions of Fig. 8K, the state of each of the enable signals $E_0$, $E_1$ and $E_2$ produced by the first control circuit $C_1$ is dependent on whether the bar code symbol reading system is in its override state of operation. To better understand the operation of control circuit $C_1$, it is helpful to consider a few control strategies ~~preformed~~ performed thereby.

On Page 52, amend paragraph 1 as follows:

In the override state of operation of the system, enable signal $E_0$ can be unconditionally set to [$E_0$=0] $E_0$=1 by the third control circuit $C_3$ setting override signal $C_3/C_1$=0. Under such conditions, the object detection circuit is enabled. Also, when the system override signal detection circuit is activated (i.e., $A_0$=1 ) or the laser scanning and photoreceiving circuits activated (i.e., B=1) and override signal $C_3/C_1$-1=1, then enable signal $E_0$=1 and therefore the object detection circuit is automatically deactivated. The advantage of this control strategy is that it is generally not desirable to have both the laser scanning circuit 108 and photoreceiving circuit 109 and the object sensing circuit 105 active at the same time, as the wavelength of the infrared LED 148 typically falls within the optical input spectrum of the photoreceiving circuit 109. In addition, less power is consumed when the object detection circuit 107 is inactive (i.e., disabled).

On Page 57, amend paragraphs 2 and 3 as follows:

As shown in Fig. 8P, the third control module $C_3$ provides override signals [$C_3/C_2$-1] $C_3/C_{2\text{-}1}$ and [$C_3/C_2$-2] $C_3/C_{2\text{-}2}$ to the first and second inputs of NAND gate 205 and to the first input of NAND gate 207 and the first input of NAND gate 208, respectively. The range selection signal R produced from range selection circuit 115 is provided as input to NAND gate 206. As shown, output of NAND gate 205 is provided as the second input to NAND gate 206. The output of NAND gate 206 is provided as the second input to NAND gate 207 and the second input to NAND gate 208. As shown in Fig. 8P, the output of NAND gate 207 is provided as an input to NOR gate 211 and ~~invertor~~ inverter 209, whereas the output of NAND gate 208 is provided as inputs to NOR gates 211 and 212 and ~~invertor~~ inverter 210. The output of ~~invertor~~ inverter 209 is provided as the other input to NOR gate 212 and one input to NOR gate 213. The output of ~~invertor~~ inverter 210 is provided as another input to NOR gate 213, whereas the output thereof provides control override signal $C_2/C_1$. So configured, the combinational logic of the second control circuit $C_2$ maps its input signals to its output signals in accordance with the logic table of Fig. 8Q.

Upon entering the bar code symbol reading state, third control module $C_3$ provides override control signal $C_3/C_1$ to first control circuit $C_1$ and second control circuit $C_2$. In response to control signal $C_3/C_1$, the first control circuit $C_1$ produces enable signal $E_1=1$ which enables scanning circuit, 109 photo-receiving circuit 109 and A/D conversion circuit 110. In response to control signal $C_3/C_2$, the second control circuit $C_2$ produces enable signal $E_2=0$, which disables bar code symbol detector circuit 111. Thereafter, third control module $C_3$ produces enable signal $E_4$ to enable symbol decoding module 119. In response to the production of such signals, the symbol decoding module decode processes, scan line by scan line, the stream of digitized scan data contained in signal $D_2$ in an attempt to decode the detected bar code symbol within the second predetermined time period $T_2$ established and monitored by the third control module $C_3$. If the symbol decoding module 119 successfully decodes the detected bar code symbol within time period $T_2$, then symbol character data $D_3$ (representative of the decoded bar code symbol and typically in ASCII code format) is produced. Thereupon symbol decoding module 119 produces and provides the third control activation signal $A_3$ to the third control module $C_3$ in order to induce a transition from the bar code symbol reading state to the data packet transmission state. In response thereto, ~~a~~ two distinct events occur. First the third control module $C_3$ produces and provides enable signal $E_5$ to data packet synthesis module 120. Secondly, symbol decoding module 119 stores symbol character data $D_3$ in a memory buffer associated with data packet synthesis module 120.

On Page 60, amend paragraph 2 as follows:

In a typical application of the present invention, a (resultant) system of bar code symbol reading subsystems ~~are~~ is installed in physical proximity with each other. Typically each system is a point of sale (POS) station including a host computer system interfaced with a base unit of the present invention and an automatic hand-supportable bar code symbol reading device preassigned to one of the base units. To register (i.e., associate) each bar code symbol reading device with a preassigned base unit, each bar code symbol reading device is preassigned a unique "Transmitter Identification Code" which is stored in a memory in the assigned base unit during a set-up procedure. In the illustrative embodiment, the carrier frequency of the data packet transmitter in each bar code symbol reading device is substantially the same for all bar code symbol reading devices in the resultant system. Also, the data packet transmission range of each bar code symbol reading device will be substantially greater than the distance between each bar code symbol reading device and a neighboring base unit to which the bar code symbol reading unit is not assigned. Consequently, under such operating conditions, at any instance in time, any base station in the resultant system may simultaneously receive two or more packet modulated

carrier signals which have been transmitted from two or more bar code symbol reading devices being used in the resultant system. These bar code symbol reading devices may include the bar code symbol reading device preassigned to the particular base unit as well as neighboring bar code symbol reading devices. Thus due to the principles of data packet transmission of present invention, there exists the possibility that any particular base unit may simultaneously receive two or more different data packets at any instant in time, thereby creating a "packet interference" situation.

On Page 63, amend paragraph 1 as follows:

In Figs. 11 and 12, the data packet transmission and reception scheme of the present invention is shown for the case of ~~hree~~ a three station system. In the best case scenario shown in Fig. 11, the group of data packets transmitted from each bar code symbol reading device is transmitted at a time when there are no neighboring bar code symbol reading devices transmitting data packets. This case will occur most frequently, as the total transmission times for each group of data packets is selected to be substantially smaller than the random time durations lapsing naturally between adjacent data packet transmissions from neighboring bar code symbol reading devices. This fact is illustrated in Fig. 11, in which (i) a group of data packets from bar code reading device No. 1 are transmitted between adjacent groups of data packet transmitted from bar code symbol reading devices Nos. 2, 3 and 4 without the occurrence of data packet interference (i.e., collision). In most instances, the time delay between consecutive groups of data packets transmitted from any particular bar code symbol reading device, will be sufficient to permit a neighboring bar code symbol reading device to transmit at least one data packet to its base unit without the occurrence of data packet interference.

On Page 64, amend paragraph 2 as follows:

Beginning at the START block of Main System Control Routine and proceeding to Block A of ~~Fig.13A~~ Fig. 13A, the bar code symbol reading system is "initialized". This initialization step involves activating system override circuit 100, first control circuit $C_1$ and oscillator circuit 101. It also involves deactivating (i.e., disabling): (i) all external system components except the range selection circuit 115 and OO/OFF switch 103 (i.e., infrared sensing circuit 105, laser scanning circuit 108, and photoreceiving circuit 109); (ii) all subcircuits aboard ASIC chip 133 not associated with the system override circuit 100, such as object detection circuit 107, A/D conversion circuitry 110, second control circuit $C_2$ and bar code presence detection circuit 111;

and (iii) third control module 114, symbol decoding module 119 and data packet synthesis module 120. In addition, all timers $T_1$, $T_2$, $T_3$, $T_4$, and $T_5$ are reset to $t = 0$.

On Page 66, amend paragraph 1 as follows:

At Block J, the third control module $C_3$ polls (i.e., reads) the parameter R set by range selection circuit 115 and sets a range limit flag in the symbol decoding module 119. At Block K third control module $C_3$ activates the symbol decoding module 119 using enable signal $E_4$, resets and restarts timer $T_2$ permitting it to run for a second predetermined time period (e.g., $0<T_2<1$ second), and resets and restarts timer $T_3$ permitting it to run for a third predetermined time period (e.g., $0<T_3<5$ seconds). At Block L , the third control module checks to determine whether control activation signal $A_3=1$ is received from the symbol decoding module 119 within $T_2=1$ second, ~~indicative~~ indicating that a bar code symbol has been successfully read (i.e., scanned and decoded) within the allotted time period. If control activation signal $A_3=1$ is not received within the time period $T_2=1$ second, then at Block M third control module $C_3$ checks to determine whether control activating signal $A_2=1$ is received. If a bar code symbol is not detected, then the control system returns to Block A, causing a state transition from bar code reading to object detection. However, if at Block M the third control module $C_3$ receives control activation signal $A_2=1$, ~~indicative~~ indicating that a bar code once again is within the scan field, then at Block N the third control module $C_3$ checks to determine whether time period $T_3$ has elapsed. If it has, then the control system returns to Block A. If, however, time period $O \leq T_3 \leq 5$ seconds has not elapsed, then at Block K the third control module $C_3$ resets and restarts timer $T_2$ to run once again for a time period $O \leq T_2 \leq 1$ second, while $T_3$ continues to run. In essence, this provides the device at least another opportunity to read a bar code present within the scan field when the control system is at control Block L. During typical bar code reading applications, the control system may progress through the control loop defined by Blocks K-L-M-N-K several times before a bar code symbol in the scan field is read within the time period allotted by timer $T_3$.

On Page 69, amend paragraph 1 as follows:

At Block Z in Fig. 13C, the third control module $C_3$ then determines whether control activation signal $A_2=1$ is produced from the bar code symbol detection circuit 111 within time period $T_4$, indicating that a bar code symbol is present in the scan field during this time period. If this signal is not produced within time period $T_4$, then at Block AA the third control module $C_3$ deactivates the bar code symbol detection circuit using override signal $C_3/C_2$, and reactivates the bar code symbol decoding module 119 using enable signal $E_4=1$. At Block BB, the third control

module $C_3$ resets and restarts timer $T_2$ to run over its predetermined time period, i.e., $0<T_2<1$ second. At Block CC the third control module $C_3$ determines whether control activation signal $A_3=1$ is produced by the symbol decoding module within time period $T_2$, indicating that the detected bar code symbol has been successfully decoded within this time period. If this control activation signal is not produced within time period $T_2$, then at Block DD the third control module $C_3$ determines whether control activation signal $A_2=1$ is being produced from the bar code symbol detection circuit, indicating that either the same or another bar code symbol resides within the scan field. If control activation signal $A_2=1$ is not being produced, then the control system returns to Block A, as shown. However, if this control signal is being produced, then at Block EE the third control module $C_3$ determines whether or not timer $T_3$ has lapsed, indicating that time window to read a bar code symbol without redetecting the object on which it is disposed, is closed. When this condition exists, the control system returns to Block A in Fig. 13A. However, ~~it~~ if time remains on timer $T_3$, then at Block BB the third control module $C_3$ resets and restarts timer $T_2$ and returns to Block CC. As mentioned above, the control system may flow through the control loop defined by Blocks BB-CC-DD-EE-BB a number of times prior to reading a bar code within time period $T_3$.

On Page 73, amend paragraph 1 as follows:

As shown in Fig. 16, receiving antenna element 274 is electrically coupled to an input signal port of radio receiver circuit 275 in a conventional manner. In general, the function of radio receiver circuit 275 is to receive and process the data-packet modulated carrier signal transmitted from a remote bar code symbol reader to its mated base unit. The radio receiver circuit of the illustrative embodiment can be realized by configuring several commercially available IC chips together, although it is understood that there are certainly other ways in which to realize the basic functions of this circuit. As shown in Fig. 16A, receiving antenna 274 is connected to a matching filter circuit 287 realized by using miniature inductive and capacitive components. The matching filter circuit is tuned to pass a 912 MHz RF carrier signal transmitted from the data packet transmission circuit 121 of the bar code symbol reading device. The output of matching filter circuit 287 is connected to the input of a first IC chip 288 which converts (i.e., translates) the frequency spectrum of the received modulated carrier signal down to an intermediate frequency band, for subsequent signal processing. In the illustrative embodiment, the first IC chip 288 is realized using the MAF2001 IC chip from Motorola, Inc., and provides a low noise amplifier 289, an double balanced mixer 290. A local oscillator 292 is needed to provide a local oscillator signal of about 922.7 MHZ for use in frequency down-conversion in the double balanced mixer 290. Typically, a matching filter 291 is commonly required between

local oscillator 292 and mixer 290. As shown in Fig. 16A, the output of the first IC chip is provided to a band-pass filter 293 tuned to about 10.7 MHZ, the intermediate frequency band of each base unit. The intermediate signal is then provided as input to a second IC chip 294. In the illustrative embodiment, the second IC chip 294 is realized using the MC13156 IC chip commercially available from Motorola, and provides *inter alia* an amplification circuit, a quadrature demodulation circuit 295, a binary thresholding circuit 296, and carrier signal detection circuit 297. The function of the second IC chip is fourfold. The first function of the second IC chip is to filter and amplify the intermediate signal to produce in-phase and quadrature phase signal components for use in digital data recovery. The second function of the second IC chip is to recover an analog data signal at the base band portion of the spectrum, by providing the in-phase and quadrature-phase signal components to the quadrature demodulation circuit 295. Suitable quadrature demodulation circuitry for use in practicing the present invention is disclosed in U.S. Patent No. 4,979,230 to Marz, which is incorporated herein by reference in its entirety. As illustrated in Fig. 16A, the third function of the second IC chip is to convert the analog data signal produced from quadrature demodulation circuit 295 into a digital data signal using a binary-level thresholding circuit 296. The fourth function of the second IC chip is to analyze the incoming signal from the output of band-pass filter 293 in order to detect the incoming carrier signal and produce a carrier detect signal $A_7$ to the base unit system controller 278. In order to produce a CMOS compatible signal, the recovered digital data signal produced from second IC chip 294 is amplified by a current amplification circuit 298 that is operative whenever a carrier signal is detected (i.e., $A_7$=1). As shown in Fig. 16, the output of current amplification circuit 298 is a serial data stream that is clocked into data packet storage buffer 277 under the control of base unit system controller 278. In general, the data packet storage buffer 277 can be realized using a commercially available Universal Asynchronous Receiver/Transmitter (UART) device. The primary function of data packet buffer memory 277 is to buffer bytes of digital data in the produced digital data stream.

On Page 76, amend paragraph 4 as follows:

The primary function of the data format conversion module 283 is to convert the format of the recovered symbol character data, into a data format that can be used by the host computer symbol 6 that is to ultimately receive and use the symbol character data. In the bar code symbol reading system of first illustrative embodiment, the data format conversion is from ASCII format to RS232 format, although it is understood that other conversions may occur in <u>an</u> alternative embodiment of the present invention. Typically, the data format conversion process is carried

out using a data format conversion table which contains the appropriate data structure conversions.

On Page 77, amend paragraph 2 as follows:

As shown in Fig. 16B, acoustical acknowledgement signal generation circuit 285 comprises a number of subcomponents, namely: a decoder circuit 305; a voltage controlled oscillator (VCO) driver circuit 306; a VCO circuit 307; an output amplifier circuit 308; and a piezoelectric type electro-acoustic transducer 303 having an output signal bandwidth in the audible range. The operation (i.e., duration) of the acoustical acknowledgment signal generation circuit 285 is controlled by base unit system controller 278 using enable signal $E_{AA}$. In the illustrative embodiment, enable signal $E_{AA}$ is a digital word encoded to represent one of a number of possible audible pitches or tones that are to be generated upon each successful reception of a transmitted data packet at a mated base station. The function of decoder circuit 305 is to decode the enable signal EAA produced by the base unit system controller and produce a set of voltage signals {$V_1$1, V2,...,Vn} which correspond to a specified pitch sequence to be produced by electro-acoustic transducer 309. The function of VCO driver circuit 306 is to sequentially drive VCO circuit 307 with the produced set of voltages {$V_1$1, V2,...,Vn} so that VCO circuit produces over a short time period (e.g., 0.5-1.5 seconds), a set of electrical signals having frequencies that correspond to the specified pitch sequence to be produced from the electro-acoustic transducer 309. The function of amplifier circuit 308 is to amplify these electrical signals, whereas the function of electro-acoustical transducer 309 is to convert the amplified electrical signal set into the specified pitch sequence for the user to clearly hear in the expected operating environment. As shown in Figs. 1 and 15A, the base housing is preferably provided with an aperture or sound port 304 so as to permit the energy of the acoustical signal from transducer 309 to freely emanate to the ambient environment of the user. In a particular application, it may be desired or necessary to produce acoustical acknowledgement signal of yet greater intensity levels that those specified above. In such instances, electro-acoustical transducer 309 may be used to excite one or more tuned resonant chamber(s) mounted within or formed as part of the base unit housing.

On Page 78, amend paragraph 3 as follows:

At Block B in Fig. 17, radio receiving circuit 275 determines whether it has received a transmitted carrier signal on its receiving antenna element 274. If it has, then the radio receiving circuit generates a system controller activation signal $A_7$, which activates base unit system

controller 278 and signal amplifier 276 shown in Fig. 16 and ~~16a~~ 16A, respectively. Then at Block C, the base unit system controller activates (i.e., enables) data packet storage buffer 277 and data packet frame check module 279 by producing activation control signals ESB=1 and $E_{PFC}$=1, respectively. At Block D, the base unit system controller determines whether it has received an acknowledgement (i.e., control activation signal $A_{PFC}$=1) from the data packet frame check module, indicating that the received data packet is properly framed. If the received data packet is not properly framed, then the base unit returns to Block A in order to redetect an incoming carrier signal. However, if the received data packet is properly framed, then at Block E the base unit system controller enables the transmitter number identification module by generating enable signal $E_{TID}$=1.

On Page 79, amend paragraph 2 as follows:

At Block H, the base unit system controller determines whether it has received an acknowledgment (i.e., control activation signal $A_{DPID}$=1) from the data packet identification module indicating that the received data packet is not a redundant data packet (i.e., from the same transmitted data packet group). If the received data packet is a redundant data packet, then the base unit system controller returns to Block A, whereupon carrier signal detection is resumed. If, however, the received data packet is not redundant, then at Block I the base unit system controller enables the symbol character data extraction module by generating enable signal $E_{DE}$=1. In response to the generation of this enable signal, the symbol data extraction module reads at Block J the symbol character data contained in the received data packet, checks the data for statistical reliability, and ~~the~~ then writes the extracted symbol character data bytes into a storage buffer (not explicitly shown).

On Page 81, amend paragraphs 1 and 2 as follows:

The one-way RF data packet transmission protocol described in detail above can be modified so that the data contained in 2-D (e.g. PDF) bar code symbols can be transmitted to the base unit of the bar code symbol reader. This would involve modifying the data packet format shown in Fig. 8R by adding two ~~additional~~ data fields between start of packet field 221 and end of packet field 226, namely: a Packet Set Number Field representative of the number assigned to each set of packets to be sent for each 2-D bar code symbol read; and a Total Number Of Packets In Set Field representative of the total number of packets to be transmitted in each set of packets. Typically, three or more sets of packets will be sent to provide sufficient redundancy in the protocol. The total number of packets in a given set will be dependent on the actual amount of

data contained in a particular 2-D bar code symbol read, and thus can vary from data transmission session to data transmission session. The protocols used at the portable bar code symbol reader and the base station can be readily modified so that the base unit will generate an acoustical acknowledgment signal to the operator only when all of the data packets in a given set of packets (in a packet group) have been received by the base unit without error.

<u>Other Illustrative Embodiments of Bar Code Symbol Reading System Of The Present Invention</u>

In general, the 2-D bar code symbol reading engine 18 described above can be embodied within diverse types of bar code driven systems, including hand-held bar code symbol readers, body-wearable bar code symbol readers, fixed counter scanners, transaction terminals, reverse-vending machines, CD-juke boxes, etc. In Figs. 18 and 19, a few illustrative examples are shown where such laser scanning engines can be embodied. Such examples are not intended to limit the scope of the present invention, but simply illustrate several of the many environments that the 2-D laser scanning module hereof might be embedded <u>in</u>.

On Page 82, amend paragraph 1 as follows:

In the illustrative embodiment, the portable data terminal 775 is realized as a transportable computer, such as the Newton® Model 2000 ~~Messagepad~~ <u>MessagePad</u> from Apple Computer, Inc. of Cupertino, California. This device is provided with NetHopper™ (2.0) brand Internet Access Software which supports the client-side of HTTP and the TCP/IP networking protocol within the Newton MessagePad operating system. Such software provides the Newton ~~Messagepad~~ <u>MessagePad</u> with a GUI-based HTTP (WWW) browser for WWW access and the like. The ~~Messagepad~~ <u>MessagePad</u> 775 s also equipped with a Motorola ~~PCMICA-based~~ <u>PCMCIA-based</u> modem card 86 having a RF transceiver for establishing a wireless digital communication link with either (i) a cellular base station, or (ii) one or more satellite-base stations connected to the Internet by way of ISP 776 in a manner well known in the global information networking art.

On Page 84, amend paragraph 5 as follows:

In Fig. 23, the system of Fig. 2 has been modified by removing all automatic object detection circuitry (e.g. IR transceiver, object detection circuit 107, etc.) and adding a manually-actuatable trigger switch 900 on the housing as shown, so as to enable the operator to produce control activation signal $A_1$ by pulling the trigger switch in a manner know in the art. This will

signal to $C_1$ that an object (and possibly a bar code symbol) is in the scan field. All other automatic circuitry within engine 18 can be used with little or no modification required. Such modifications would result in a bar code symbol reading engine 18' having virtually all of the functionalities of engine 18. Thus automatic bar code symbol reading system 1" would function much like automatic bar code symbol reading system 1, except that actuation of the trigger switch 900 is required to initiate laser scanning and system operation.